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SMART TICKET SYSTEM

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ABSTRACT

Many event venues allow attendees to present digital tickets through digital wallets or email confirmations using a basic technology, such as Quick Response (QR) codes for authentication. However, the value of the digital ticket stops there. There is no additional function for current digital ticket technology besides basic attendance to an event. This proposal seeks to take traditional digital tickets to the next step by converting them to Smart Tickets, which can encompass metadata that can enable an individualized, automated experience at any venue. By making a ticket 'smart', events can provide different tiers of experiences to different types of ticket holders. For example, VIP tickets can include metadata to unlock specific features such as prioritization of traffic during prime congestion periods, crowd visualization at food vendors, exits, etc. as well as futuristic features such as priority for driverless cars in a VIP driverless valet.

DETAILED DESCRIPTION

This proposal seeks to examine the concept of a smart ticket to unlock a truly automated event experience. At the current moment, virtual tickets exist and are used widely across events with the ability to be dispersed via email and verified by QR code. However, the use of these virtual tickets stops there and is where this proposal kicks off.

In order to enable a Smart Ticket, the ticket would need to be able to encompass metadata to unlock a variety of tools. Before delving into the metadata, consider various tools that can be utilized to enable functionality of a Smart Ticket. When an attendee enters an event, they have to check in, connect to the Wi-Fi®, buy concessions, and figure out seating. These features exist in an event at a basic level, but the Smart Ticket of this

proposal seeks to enhance that experience for ticket holders. These Smart Tickets can enable tiers of experience based on ticket-type.

For example, the Smart Tickets of this proposal can provide more features for those with very important person (VIP) tickets by including metadata to unlock a variety of applications, networks, and/or event accesses. Thus, a benefit of embedding data into the ticket is the experience. For attendees, attending the event can be as seamless as walking through the door, connecting to the VIP Wi-Fi can be as easy as selecting its name, and accessing an application (app) for VIP benefits can be as simple as navigating to the site with no ticket number, username, password entry needed. Individually, these features save minutes of time but together, could be transformational for event attendees utilizing the Smart Ticket techniques of this proposal.

An important aspect of this proposal is that it allows vendors to add digital features to different ticket holders with a lower overhead. For each application, instead of providing individual access or group access with the difficulty of management and distribution, all that a vendor would need are access tokens differing by access group that represent ticket tiers. In one implementation, these access tokens can then be added to a Smart Ticket with ease by adding the tokens into a pkPass file for the Smart Ticket. Figure 1, below, illustrates an example process flow for providing a Smart Ticket in accordance with the techniques of this proposal.

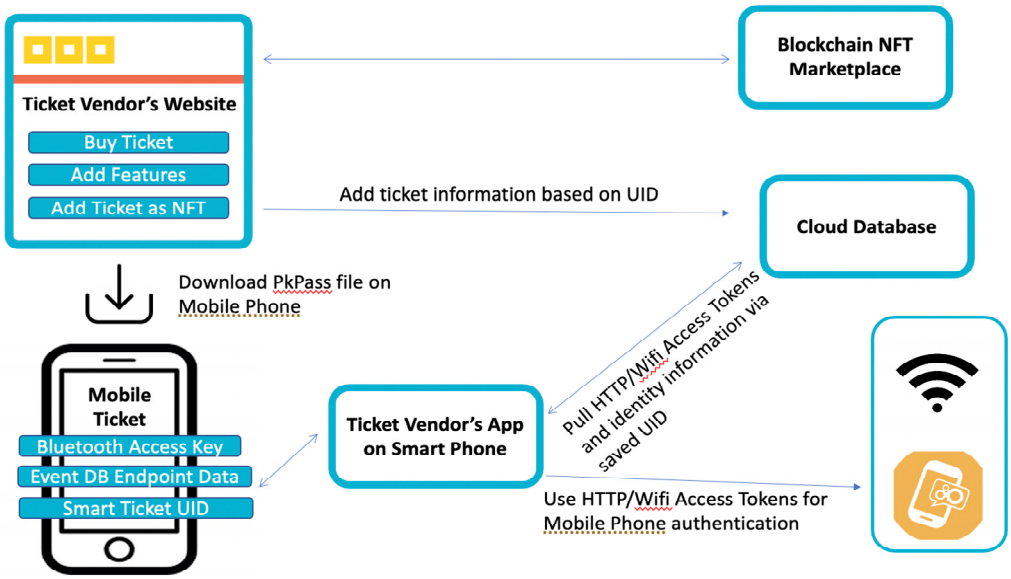

Figure 1: Example Process Flow for Providing a Smart Ticket

A central idea around this proposal is creating a ticket identity because of the multiple ways a ticket can exist: in a mobile wallet, printed out as a QR code, and/or on a Radio Frequency Identification (RFID) bracelet. If multiple approaches exist, there must be a way to manage the ticket identity to prevent fraud. Currently, this is done using QR codes and RFID/NFC technology but these technologies are disparate. In some instances, people have gone to the lengths of printing out QR codes onto bracelets in order to try to combine the style of an RFID bracelet with the ease of QR code because they just don't integrate.

In contrast, this proposal provides for the ability to manage the identity of all of these technologies in a central database—so one system can work for all approaches. This database would contain information such as ticket identifier (ID) (e.g., a unique identifier (UID), ticket holder's name (if ID is needed), whether a ticket holder is 21+, whether the ticket has been already authenticated, and which type of ticket the user has chosen. The last two fields can be used to prevent ticket duplication, in the case where someone has also printed out their ticket when they have opted for mobile wallet and if someone has handed their ticket to others after authentication.

In some instance, this database could also contain various modular features. For example, if a user has ticket type "mobile wallet", they can also add in features such as no touch entry, prioritized bandwidth, concession queue visualization, etc. The database would store the access keys necessary and be accessible by the ticket vendor application. Wristbands and ticket printouts would not be able to access these features.

In operation, a ticket vendor would act as the primary distributor and manager of a Smart Ticket. Event attendees would keep the ticket in their mobile wallet, which would contain all the access keys necessary for the ticket vendor's mobile application to connect to the cloud database for a specific event and automatically authenticate the attendees to the event, Wi-Fi access, and/or any other applications based on their purchased access. In one implementation, ticket vendor integration could be as simple as integrating a software development kit (SDK) to access a pkPass file and the database.

Consider various features that could be integrated into the Smart Ticket ecosystem. To clarify, the novelty behind this proposal is the Smart Ticket architecture and approach of using pkPass with a central database to create modular tickets. Various features

discussed herein provide examples of how third-party applications can be integrated into this ecosystem through which the Smart Ticket can enhance event experience by allowing for easy integration and use of already existing tools.

To begin, consider the most important feature of an event – entering the event. Currently, there is a labor cost associated with assigning employees to check tickets, managing long lines of attendees queueing up for their ticket to be scanned, and then for ticket holders to eventually physically present their ticket at the appropriate time. In contrast, metadata can be provided in a Smart Ticket that would allow nearby scanners to detect, as attendees walk in, that they are allowed entry into an event.

For example, various digital key solutions are offered by modern hotels. These digital keys employ Bluetooth™ and are stored within the mobile key provider's app on the smart phone. When a new digital ticket is created, the user's token is created in the app to enable the user to authenticate with the lock on the door and, as long as the user has the app open and Bluetooth turned on, the app can wake up the lock's Bluetooth receiver and authenticate the key.

As an extension, this proposal provides for store this token in pkPass in the mobile wallet of ticket holders as a piece of metadata to the ticket in order to authenticate ticket holders upon entry. As providers have managed to make such a feature modular with respect to a plastic keycard functionality, this proposal seeks to use a similar modular approach for RFID scanners so that those without phones, such as children, etc. can continue to use entry wristbands if they wish without the overhead of additional equipment.

This technology can be used beyond entry validation, but could also be used for VIP stage and queue access, as well as other on site authentication purposes. The novelty of this feature would be adding Bluetooth token technology into RFID scanners and integrating it with Mobile Wallets, therefore removing the need for a dedicated app.

Another important part of an event is internet connection. In accordance with the techniques of this proposal, ticketing can be used to create tiers of bandwidth priority. For example, attendees with VIP tickets can receive a higher priority on the network and get more value out of the money spent on a VIP ticket. Embedding a Smart Ticket with a wireless network token can enable fast and automated Wi-Fi connectivity. Different tiers

of tickets can receive access to different networks or wireless SSIDs, which can also be enabled through a Smart Ticket.

Currently, assignment of different networks to different attendees exists but, again, often involves the increased toil of grouping attendees and making sure they have different access codes and creating the risk of shared VIP access codes, security, etc. However, through the technology that can be provided by via a Smart Ticket, the ticket itself enables access and the need for manually entered codes disappears. Tools such as a network management system or the like can be utilized to enable such features would enable the ability to change Wi-Fi membership dynamically according to the ticket status. If someone decides to buy an upgraded Wi-Fi option at a time later than the original purchase date, the network management system can be triggered to upgrade the attendee's bandwidth tier and also update the cloud database accordingly.

Internet connectivity plays a big role at the end of an event. Responsible attendees, after consuming alcohol-based beverages, can choose not to drive home. So, now they need the ability to call a ride through a ride share app. For an event with hundreds to thousands of people, in a short time span where an event is ending/has ended, the network is flooded with requests and therefore becomes overloaded. This is another example in which bandwidth priority can be beneficial in a VIP ticket where those with a prioritized Wi-Fi network connection may be able to call their rides quicker than those on the regular network.

This also opens up the possibility for event organizers to partner with ride share companies to prioritize their application on the network. People will try all their apps to see which one is able to call them a ride the fastest. If a ride share company has created an agreement with an event to prioritize their application, they will get more users and therefore, a return on their investment while event organizers have more funding to create more high-tech events.

An additional feature of the Smart Ticket is its ability to store Hypertext Transfer Protocol (HTTP) tokens. Thus, if events have VIP portals or applications, a Smart Ticket can provide exclusive access to those with the right type of ticket. For example, concessions are extremely important and Smart Tickets can further help by providing automatic access to VIP applications that can provide concession visualization. By adding

HTTP tokens into the metadata of a Smart Ticket, VIP ticket holders can visualize queues through virtual queue and crowd visualization systems that currently exist. This could also be applied to the previously mentioned crowded exits to detect whether there is a crowd in advance in order to avoid traffic or difficulty in getting a ride home.

Another example of this is the ability to connect to driverless cars. As driverless cars become more commercialized, the future of events will likely include the management of these cars and providing digital guidance for them to park in respective parking spots. In other words, events will need to provide a VIP Driverless Valet. The technology to send a destination already exists for some cars. In accordance with this proposal, a Smart Ticket can provide the ability to add a driverless car and send it specific directions to a specific parking garage at an event or send it through a VIP-only path to its parking spot. Even if a Smart Ticket it is not doing it directly, the ticket can provide access to an application that can send this information to the driverless car. VIP tickets can provide premium parking, security, more convenient pick-up and drop-off locations, and other features limited to specific ticket holders with access provided by the smart ticket.

Thus, many different features can be provided through a Smart Ticket. Figure 2, below, illustrates example details associated with a Smart Ticket ecosystem through which different features can be provided to a Smart Ticket holder.

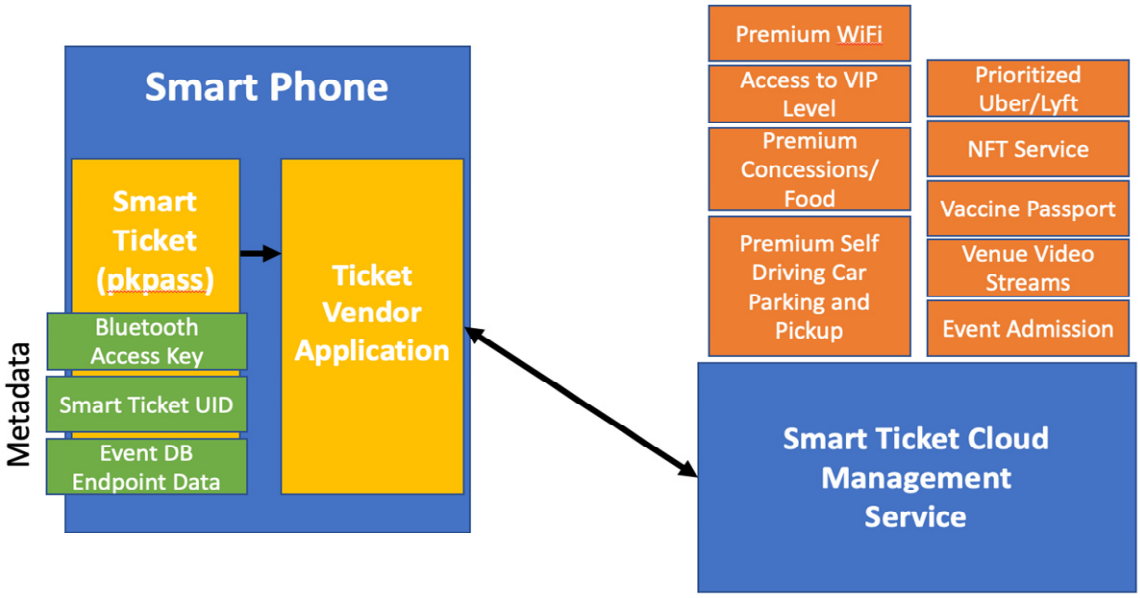

Figure 2: Smart Ticket Ecosystem Features.

The above use cases are just some of the many features that can be integrated into a Smart Ticket. In some instances, these types of applications can have their own mobile applications and/or web applications, which can be adjusted to include event-specific features/specials/promos that take in a specific key. This key can also be stored in the database and pulled by the ticket vendor app in order to authenticate into the application.

One example of an event-specific may be the ability to convert a Smart Ticket to a Non-Fungible Token (NFT) according to the Non-Fungible Token Standard. NFTs have become increasingly popular due to their ability to maintain authenticity in a world of copy-paste. Thus, in some instances it may be possible to assign each ticket for an event as an NFT so that the tickets can be stored and sold as collectibles in the future, depending on how their value appreciates over time. Events hold a sentimental value and this can increase over time as it turns into nostalgia. Adding an NFT to a Smart Ticket adds a unique, irreplaceable identifier can be stored in the database as well, giving ticket holders ownership to use as they wish in the future. Ideally, the pkPass file would be stored as the NFT because it would contain the image of the ticket in mobile wallet as well as its associated metadata.

NFTs are issued via a given Blockchain, and each Blockchain has its own separate NFT token standard, compatible wallet services, and marketplaces. These NFT tokens can be added to any Blockchain deemed appropriate by ticket vendors and the backend behind the database can programmatically add the NFT tokens to the desired Blockchain. Such a feature can also add a layer of security around the Smart Tickets of this proposal. By adding Smart Tickets to a Blockchain, it can be assured that tickets cannot be changed or tampered with and are also protected from hacking.

The Smart Tickets of this proposal can be utilized through a variety of event venues, such as any connected stadiums, movie theaters, meeting centers, etc. that may provide an Internet Protocol (IP) network infrastructure through which service providers can take advantage of the Smart Ticket's modularity to offer different services and features. In one instance, the Smart Ticket solution provide an avenue for a Software-as-a-Service (SaaS) solution. Further, the Smart Ticket solution may also incorporate 5G services and features, in some implementations, such as the application of different Quality of Service (QoS)

levels (e.g., higher level of QoS for VIP ticket holders), different throughput rates, and/or the like for Smart Ticket holders.

As noted above, a network management system can be utilized to facilitate device/Wi-Fi management for a Smart Ticket. Consider an example operational flow, as shown below in Figure 3, through which a network management system can be utilized to enable different Smart Ticket features, as discussed herein.

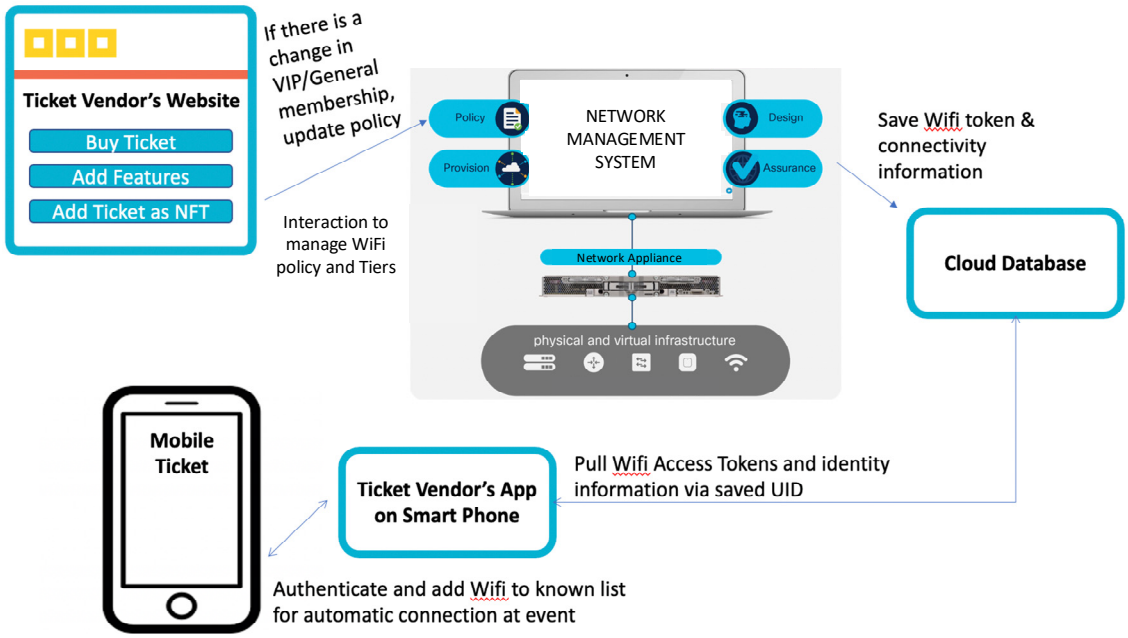

Figure 3: Network Management System Flow

As shown in Figure 3, the network management system can be utilized to create user policy and tiers and the Smart Ticket would be able to embed the policy into the ticket so when the ticketholder enters an event, their policy is in effect through their mobile phone. This could also be extended to third-party applications that could be utilized at the event, as it may be less overhead for the application developers and a lot less overhead for event organizers to add and offer smart features to events.

In one instance, dynamic network tiers can be provided via the network management system. For example, consider that changes are made to the Smart Ticket database in the cloud that trigger a tier change within the network management system. Thus, information from the database can be obtained by the network management system,

which can determine an associated Wi-Fi token and connectivity information based on an attendee's tier. Potential tiers can include VIP, vendors, admins, and general, among others.

In one instance, vendors can associate their endpoints (access points (APs)) in an event configuration within the database, which could then enable an automatic network connection option for users. This would take away the complexity for the Smart Ticket's backend to have to manually connect users to a hierarchy of network tiers, but instead use built-in automation that may be provided by the network management system. Additionally, the network management system may provide Application Programming Interfaces (APIs) for Wi-Fi-enabled services to provide for the ability to view tracking and analytics on connected devices. These features can help to make the software-defined policy and connection capability a reality for a Smart Ticket. Being able to view tracking and analytics on connected devices in an event venue can provide valuable insights into where to concentrate APs for a better future experience.

Accordingly, the Smart Ticket innovation of this proposal can provide all of the capabilities of an RFID wrist band plus the integration of digital experiences and access, along with potentially many other functions. This technology provides for the ability to take an existing piece of hardware, a smartphone, and provide an all-encompassing ticket on the mobile wallet of the smartphone. Through the Smart ticket, an event attendee can access a variety of VIP applications specifically offered by the event with little to no overhead. All the attendee would have to do is navigate to a website or a mobile app and they can be automatically authenticated. The Smart Ticket can provide access to all related event software and applications.

Consider various example use-cases through which the Smart Ticket can be utilized to enhance user experiences. For example, an amusement park phone app may provide RFID band ride access with services like photo downloads. However, everything that the RFID band is integrated with may be closely coupled such that tickets have to be stored in the amusement park app and are not integrated with the mobile wallet. Thus, all applications that the access is integrated with may be offered only through the app itself, such that authentication to third-party platforms may not be provided automatically.

For such a use-case, the open architecture of this proposal involving pkPass may be utilized to offer more capabilities and functions, such as providing enhanced access for

events that may be associated with multiple entities offering services along with custom event functions that can be integrated into pkPass. These events can include sporting events, concerts, festivals, and so on. In accordance with the techniques of this proposal, the ticket metadata that can be associated with a Smart Ticket on a mobile device or through the cloud may provide a better approach to provide an all-encompassing experience for park attendees.

In terms of RFID-related Near Field Communication (NFC)-related wrist band features, such as accessing rides, getting admission through the entrance, etc., this is also possible using the technology of this proposal by simply leveraging the same digital key technology that hotels use to allow customers to unlock doors with their mobile phones, as discussed above.

Further, RFID/NFC bands involve a physical band to be sent out to attendees, which has high overhead and low transferability. In contrast, the Smart Ticket of this proposal could replace easily replace the need for a physical band. NFC technology is already integrated into many smartphones and integrated with mobile wallets, so this could potentially be a supporting feature. Thus, no-touch authentication using a mobile phone could be a potential technical implementation for the Smart Ticket of this proposal.

Accordingly, the technology of this proposal provides for the ability to take traditional digital tickets to the next step by converting them to smart tickets by taking advantage of pkPass's ability to store metadata. The pkPass format is the standard for digital tickets and, instead of changing this standard, this proposal seeks to amplify the pkPass format to facilitate different features. The pkPass can be enhanced to store Bluetooth access keys, event database information, and a ticket UID that would allow us to access individualized data across a variety of applications automatically. This would create an automated experience for ticket holders and give event organizers the ability to provide more value for VIP tickets by adding additional features with lower overhead. Creating digital identity around tickets also allows for the ability to easily associate Smart tickets as NFT assets for customers.

Although a core feature of the technology proposed herein may be focused on the storage of additional data in a pkPass file, this proposal also provides a framework to create and enable connectivity for Smart Ticket holders. One can use their ticket to access

everything from software to physical authentication when previously it was just physical authentication alone. This allows for taking many pieces that already exist–digital/mobile tickets, Bluetooth authentication, event-specific applications/automation, NFCs, etc.–and being able to combine them together into one Smart Ticket. Thus, a generalized structure for a Smart Ticket ecosystem is provided that can be utilized to establish identity, value, and convenience for ticket holders no matter what event they may attend.